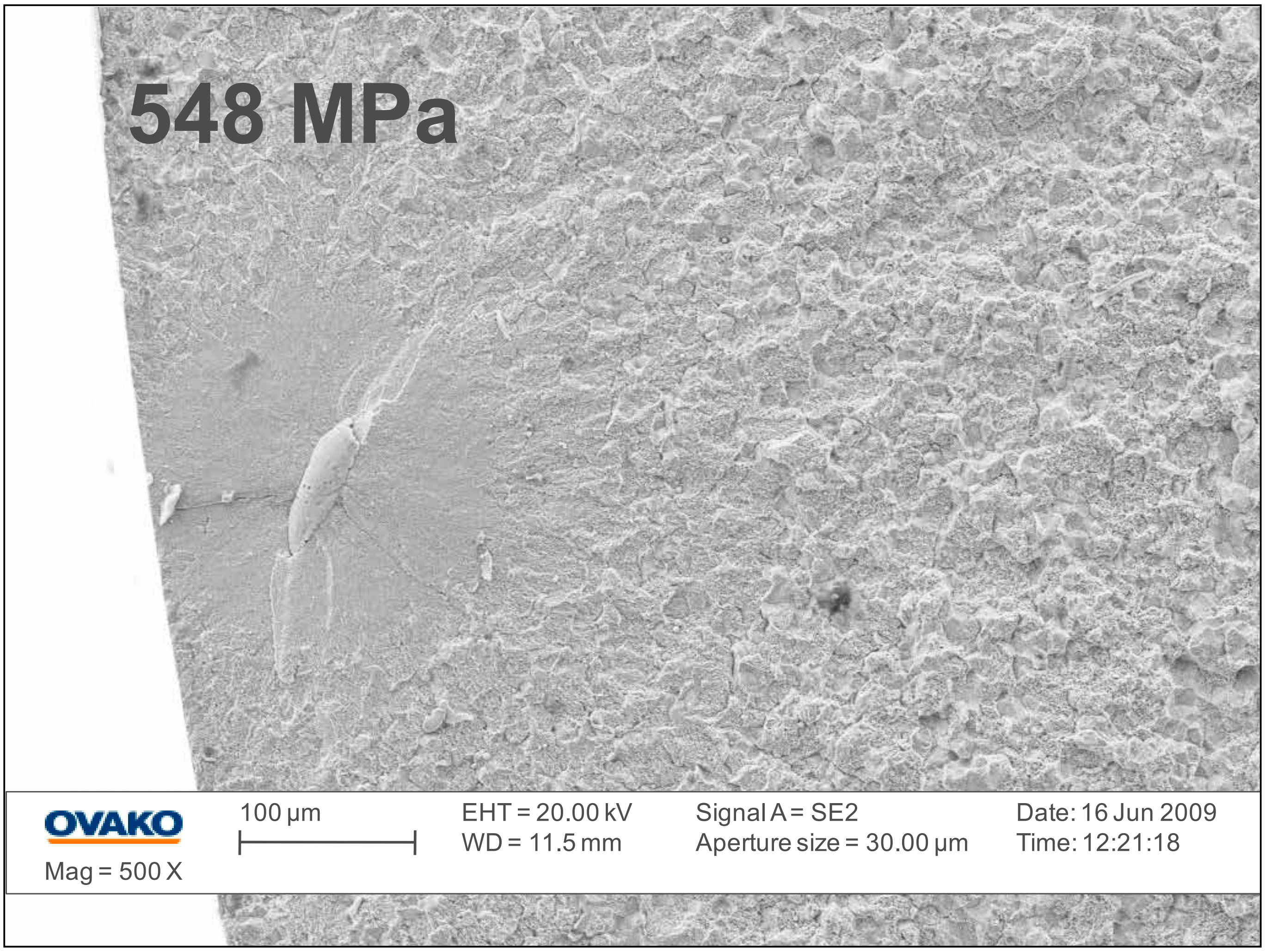
RETHINK YOUR DESIGN OPPORTUNITIES
BQ-STEEL® AND IQ-STEEL®

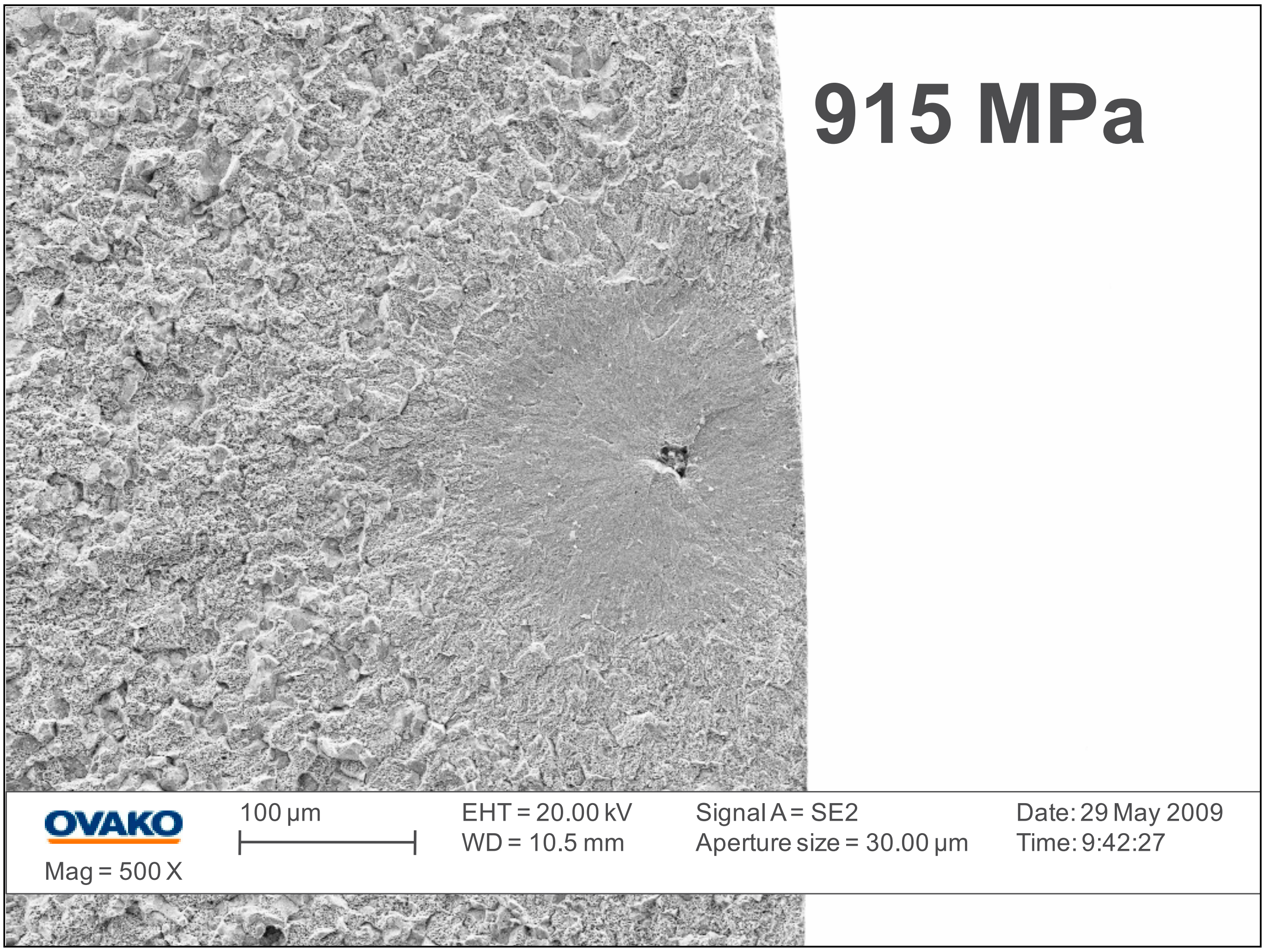
Constructions in engineering steel are in most cases subjected to cyclic stress over a long time. This makes fatigue normally the limiting property. From experience it is known that defects such as non-metallic inclusions will initiate these fatigue failures.

The required stress is significantly lower than the yield or fracture strength i.e. the static strength. Ovako has focused very much on fatigue research and today we have an impressive database with fatigue data. We know and can show that the steel quality can have a huge impact on the fatigue life of a component.

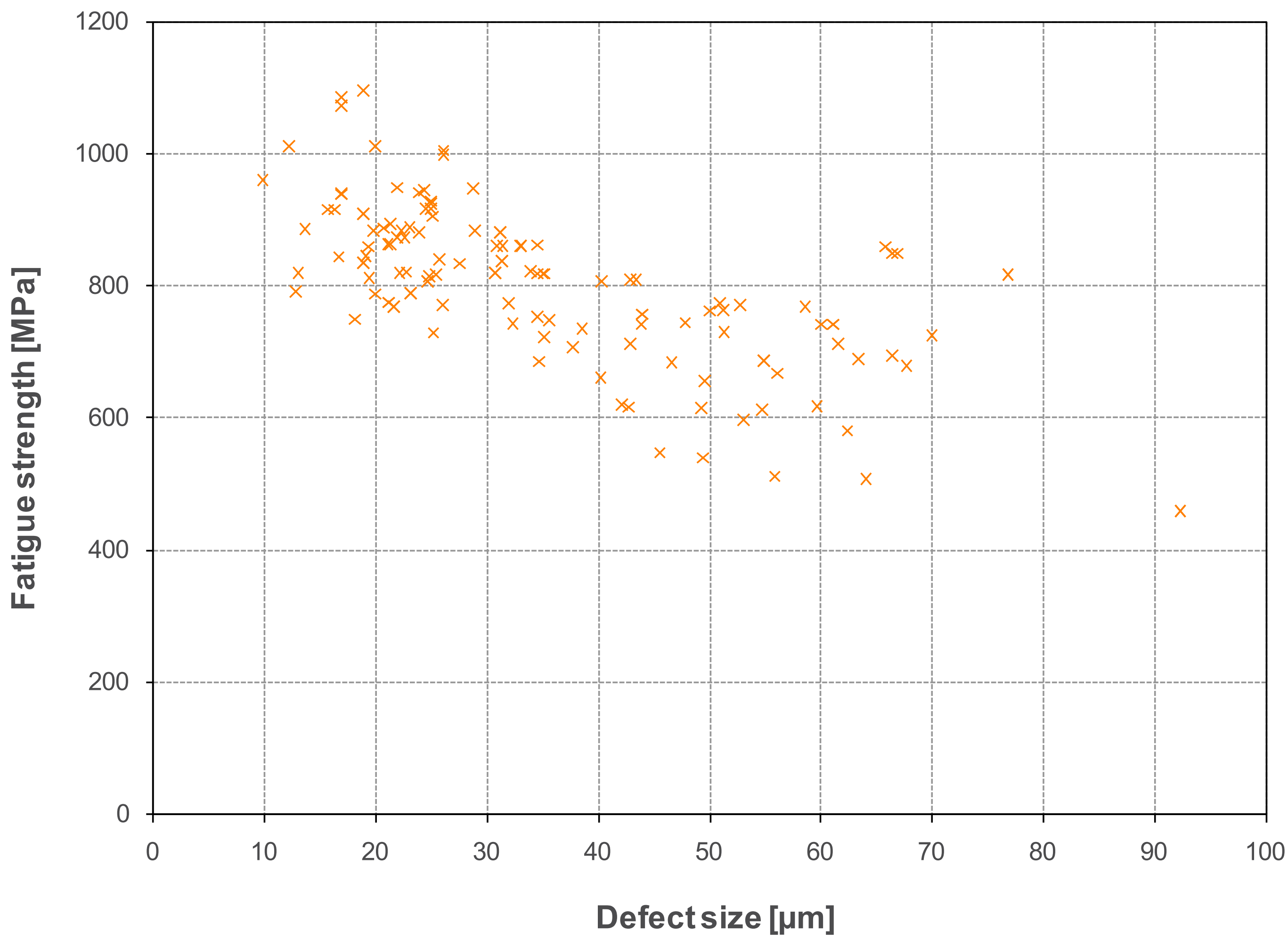


We have looked at thousands of fatigue failures. In our scanning electron microscope we determine the position, type and sized of all failures. We know exactly what stress that was required to initiate the fatigue crack.

Analyzing the data it is clear that a larger defect like the one on this picture will require a lower stress to initiate a fatigue failure compared to…

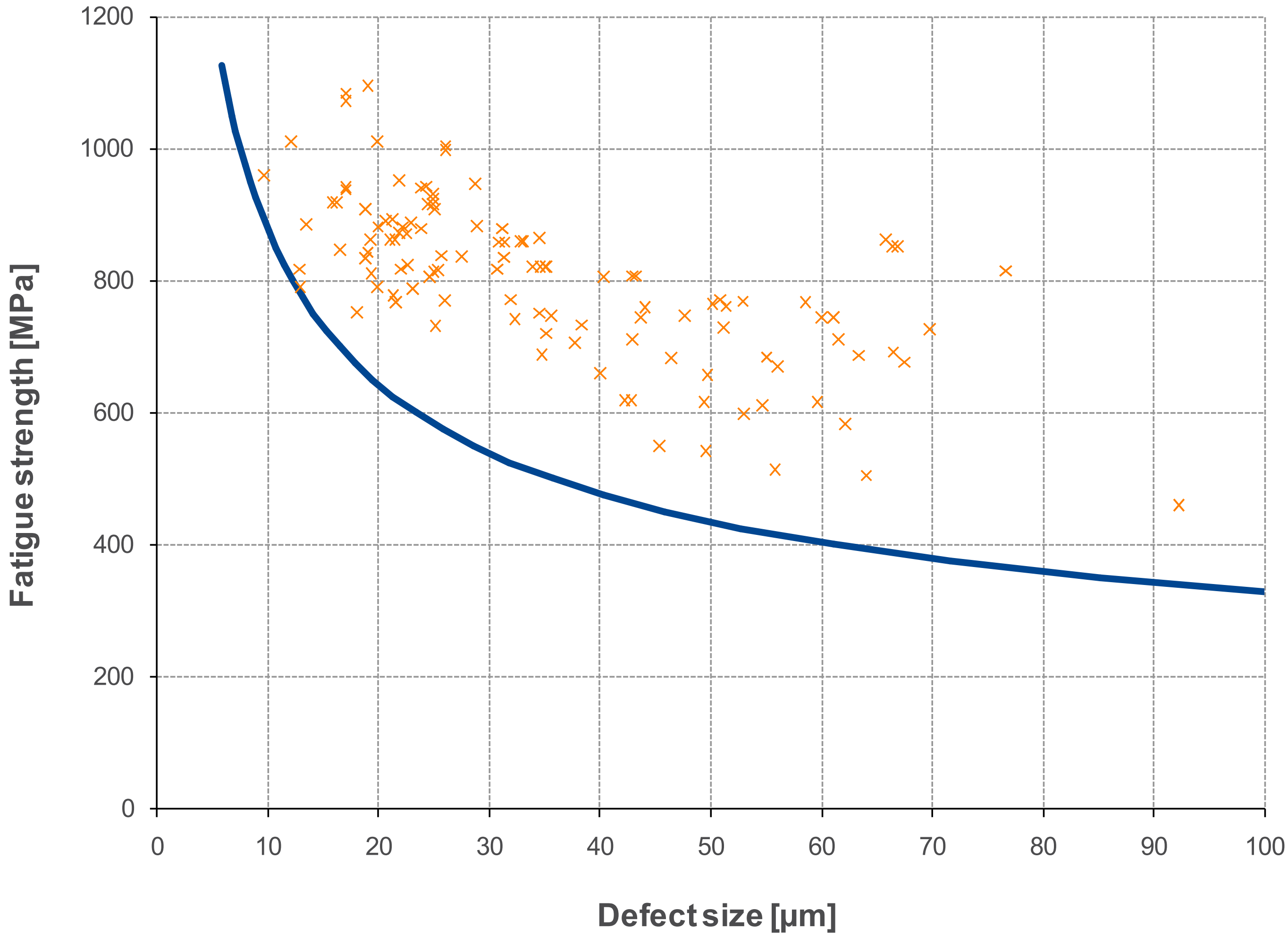


... a smaller defect like the one you see on this picture.

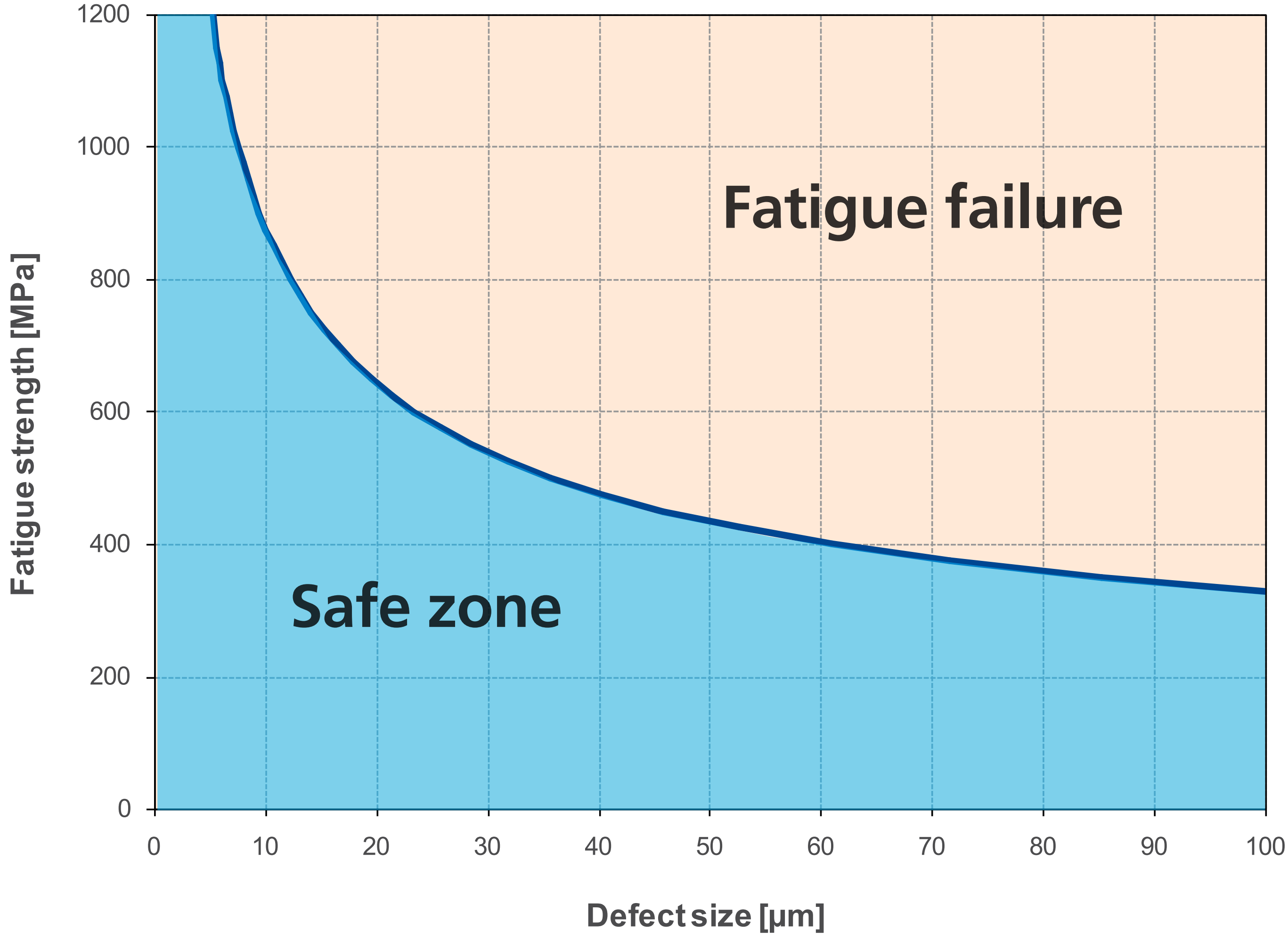


The data can be plotted in a graph.

It is obvious that if there are larger defects present a lower stress is required to initiate a fatigue failure.

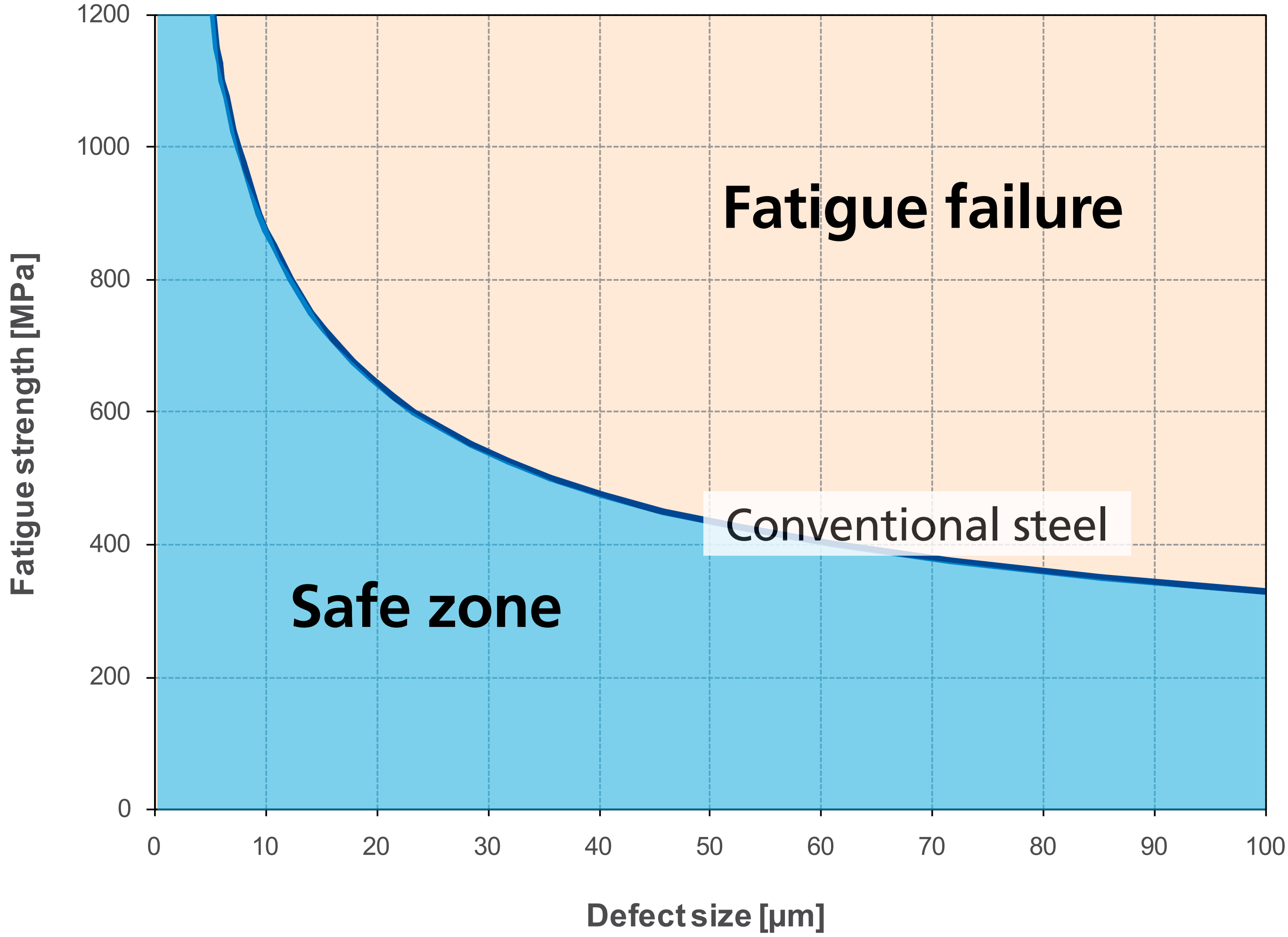


If we add a line separating the failures from where we have no failure we can construct a graph with a line separating the conditions when you may expect fatigue failures and not.



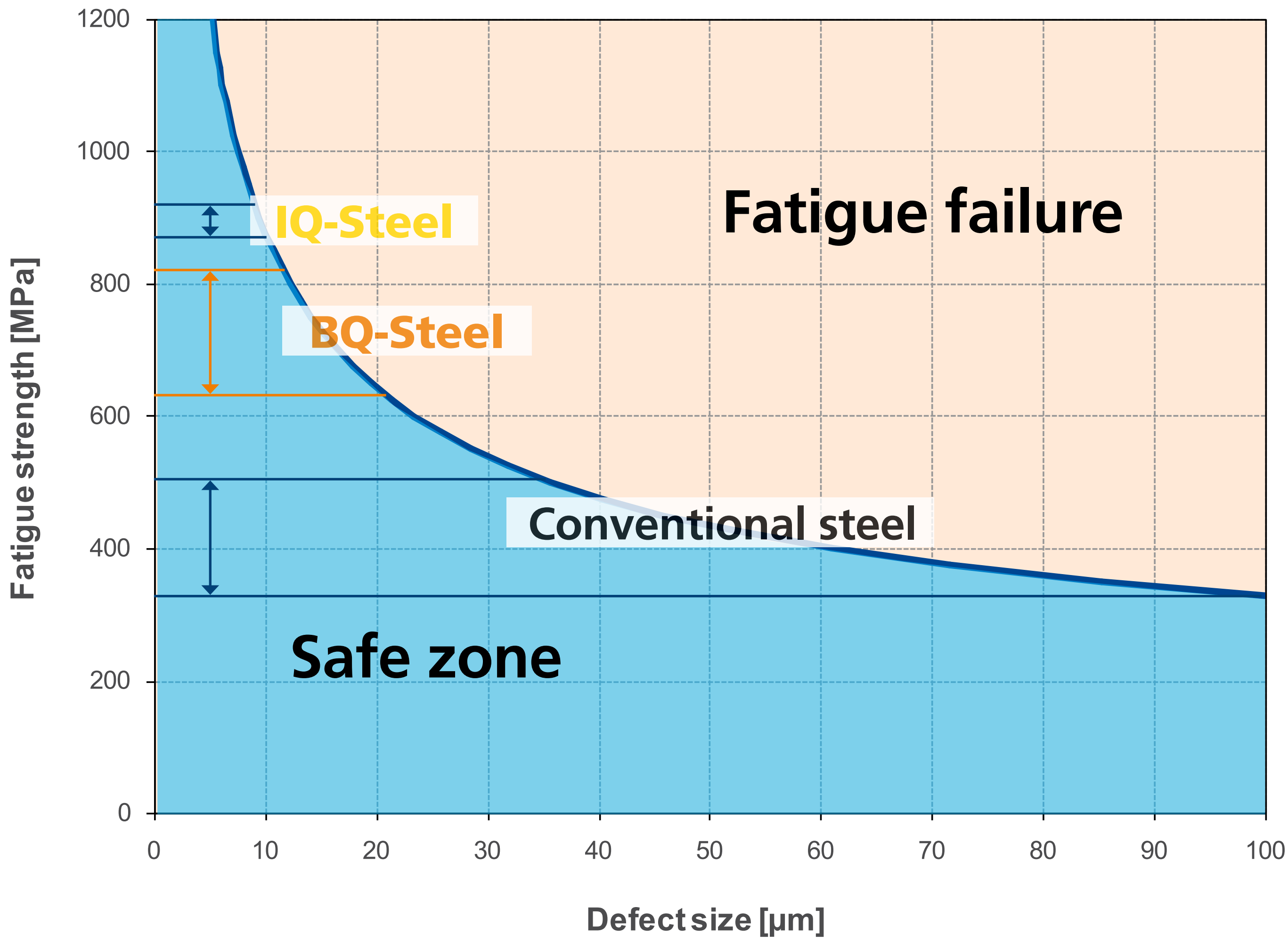
If you remove the data points it becomes a simple graph with two areas. A “Safe zone”, where you will not have fatigue failures, and a ”Fatigue failure” zone.

Unfortunately, the international standards assessing steel cleanliness are not capable of showing where you are on this curve. We have seen that conventional steel in many cases have significant amounts of defects in the size range around 60, 70, 80 µm or even larger.



As a consequence a stress around 400 MPa will be the limiting stress. Since the slope is relatively flat at this end of the curve there is not a dramatic effect if the steel contains 60 or 100 µm sized inclusions.

Ovako has worked long and hard to control and limit inclusions in steel. Today we have qualities that are shifted towards a much smaller size range.



The BQ-Steel and IQ-Steel has significantly smaller inclusions sizes compared to conventional steel. At this part of the curve the slope is much steeper. This means that the gain in fatigue strength is increasing dramatically.

We see this as a huge opportunity to rethink design solutions. Either by reducing the weight, increasing the power density, or both.